Radio observations

First results of radio observations by CMW: the 2003 Perseids

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The first results of radio meteor observations made by the Polish Comets and Meteors Workshop (CMW) using the forward scatter technique are presented. Full coverage of the 2003 Perseid maximum showed a peak around $\lambda_\odot = 139\overset{\circ}{.}87$.

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1 Introduction

The aim of forward scatter radio observations is the recording of meteor phenomena by receiving the signal of a distant radio station (about 500 – 2000 km from the receiver). Normally it is impossible to receive it directly due to the curvature of the Earth. When meteoroid matter burns it ionizes the surrounding atmosphere. This allows it to reflect the signal from the radio station (at a frequency in the range 40–180 MHz) so it can be detected by the receiver. The first long-term CMW observations using forward scatter were made during the 2003 Perseid maximum at Rybnik Kamień ($\varphi = 18°36'$ E, $\delta = 50°08'$ N).

2 Equipment description

We decided to make observations in the VHF sound broadcast band (87.5–108 MHz) using a 3-element Yagi antenna connected by co-axial cable a to car digital tuner. The antenna and receiver were situated far away from each other to avoid interference. An eight-bit analogue-to-digital converter (ADC) was made by ourselves to feed the computer with the radio signal. We used a Pentium 200 MHz, 16 MB RAM computer with about 500 MB of hard disk space. This can be seen in Figure 1.

In our first attempt at forward scatter we decided to make only counting observations. We used free software Meteor v8.2 a written by Pierre Terrier and available via the Internet (`http://radio.meteor.free.fr`).

3 Results of 2003 Perseid peak observations

The equipment preparations were finished a day before main Perseid peak. First we had to find an appropriate frequency to detect meteor signals. We found a free channel at about 103.3 MHz, with the antenna directed south, at which we could detect meteor phenomena but with no direct reception of any radio station from the Czech Republic.

We started our observations on 2003 August 12 at 20:00 UT and covered the whole Perseid maximum. Continuous observations were continued until August 21 to reduce daily variations in meteor activity (see Figure 2). We corrected the Perseid peak using those data and took into account the radiant elevation using the formula given by (Ogawa, 2002) (Figure 3).

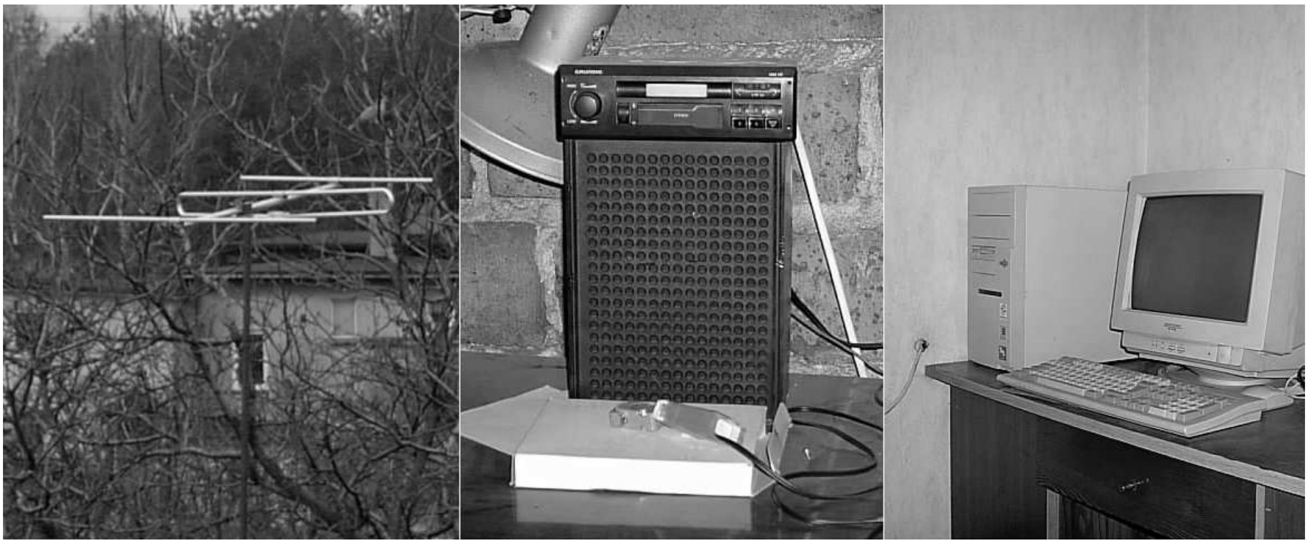

Figure 1 – Equipment used, left to right: antenna, receiver with ADC below and computer.

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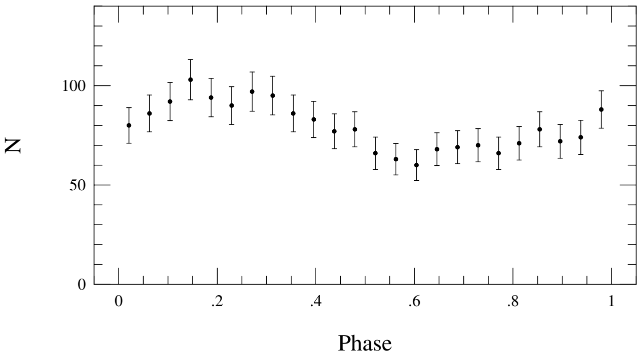

Figure 2 – Average number N of meteor echoes throughout the day, observed between 2003 August 13 and 21. Phases 0.0 and 1.0 correspond to $00^{h}00^{m}$ UT, 0.5 to $12^{h}00^{m}$ UT.

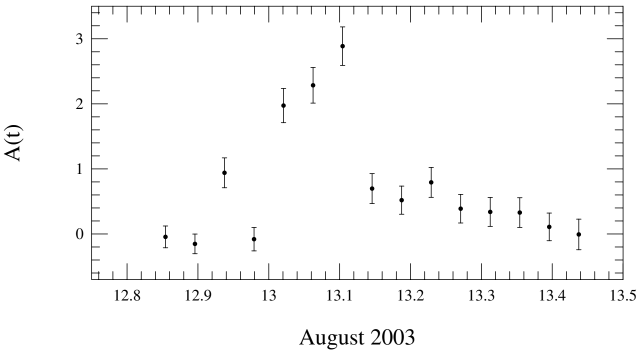

Figure 3 – Radio activity function $\mathbf{A(t)}$ during the Perseid maximum.

Esko Lyytinen predicted that the 2003 Perseid peak would be between $\lambda_{\odot} = 139\overset{\circ}{.}81$ and $139\overset{\circ}{.}82$ (`http://groups.yahoo.com/group/imo-news/message/1202`). We detected higher activity at $\lambda_{\odot} = 139\overset{\circ}{.}87 \pm 0\overset{\circ}{.}04$, which is about 1.5 hours after the predictions.

Acknowledgments

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References

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